Cinematic AI:

Find The Movies You'll Love

Explore the captivating world of cinema through a targeted browsing experience powered by:

- Sentiment Analysis
- Emotion Detection
- Similarity Recommendations

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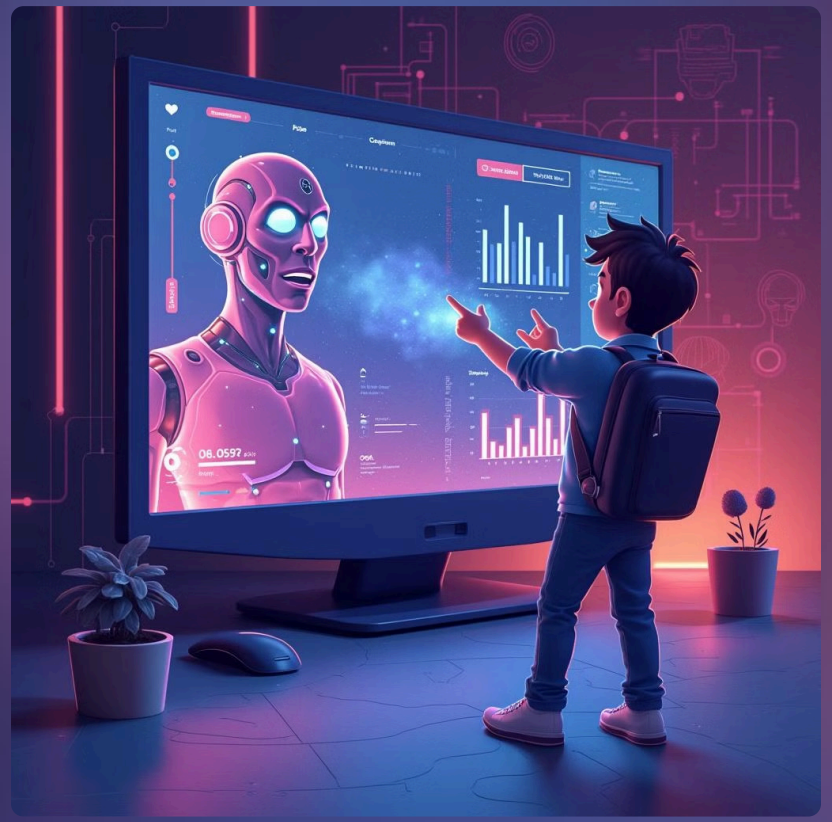
Product Overview

Our application creates an all-in-one interface that allows customers to access both movies insights and recommendations on the same platform. Here is an overview of the process:

1. User is prompted to select a movie
2. System locates movie reviews based on selection and analyzes the reviews based on sentiment
3. Emotion Detection Algorithm classifies the description of the movie based on emotion
4. Recommendation system provides with a cinematic body of work based on movie selection



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Model Setup and Training

Data Collection & Preprocessing

- DataFrame: comprised on Sentences and corresponding Emotion
- Preprocessing & Label Encoding
  - Remove whitespace and splitting sentences based on delimiter
  - Emotion Labels encoded into format suitable for training.

Training & Testing

- **Train-validation split technique** used for effective learning and validation of performance
- Callback techniques used to monitor training and prevent overfitting
  - **ModelCheckpoint**
  - **EarlyStopping**

Interpretation & Results

- Sentiment Analysis
- Emotion Detection
  - Joy
  - Sadness
  - Anger
  - Fear
  - Love
  - Surprise

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High-Dimension Sentiment Analysis

1 Support Vector Machine (SVM)

- Vectorization
  - TF-IDF
- Kernel Function
  - Linear
- Hyperplane Classification

2 Feature Extraction

- Convert text data into numerical form
- TF-IDF Vectorization
  - Frequency of term in dataset

3 SVM Sentiment

- **Hyperplanes** (decision boundaries) in high-dimensional space
- Uses the **largest margins** to classify the positive and negative data points

4 Kernel Trick

- **Mathematical function**
- Employed to reorganize dataset for **nonlinear classification**

5 Required Expertise

- Parameter Tuning
  - Kernel Selection
  - Regularization Parameters

6 Challenges

- Interpretability of SVM Models with non-linear kernels
- Decisions Trees provide better BI visuals

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The Layers of Emotion Detection

1 Deep Neural Architecture

- Input & Attention Masks
- BERT Embedding
- Global Average Pooling1D
- Dense Layer
- Dropout Layer
- Output Dense Layer

2 Inputs & Attention Mask

- Input layer structured to take in sequence of up to 100 tokens
- Attention Masks layer used to indicate which tokens require attention and which should be ignored

3 BERT Model Embedding

- **Custom keras layer** to processes sequence of up to 100 input tokens, along with the attention masks, producing 768-dimensional embedding vectors

4 Global Average Pooling1D

Applied to output of BERT embeddings to **compute the average value across all 100 tokens** and collapse it into single compact vector, making it easier for subsequent layers to process

5 Dense & Dropout Layer

- Dense is fully connected 64-unit layer that applies linear transformation with learned weights to reduce 768-dimension to 64-dimensions
- Dropout is layer used to prevent overfitting by setting a fraction of the input units to zero during training.

6 Output Layer

- **SoftMax Function** used to fully connected 6-unit output layer, with the units corresponding to the 6 emotion classifications
- Output layer produces 6-dimensional vector representing the probability of the input belonging to one of the 6 emotion classifications

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Content Generated Recommendations

1 Recommendation Function

- Title Matching
- Similarity Computation
- Sorting & Selection
- Recommendations

2 Title Matching

- Uses the **str.contains()** method from pandas to search for movies based on user's input, ignoring case sensitivity.
- This method allows for partial matches and is robust against variations in title input.

3 Similarity Computation

- The function uses a pre-computed **cosine similarity matrix (cosine_sim)** that compares all movies in the dataset based on their TF-IDF scores from combined title and genre data
- Retrieves the similarity scores for the first matched movie against all other movies

4 Sorting & Selection

- The similarity scores are sorted in descending order to identify the movies with the highest **content similarity**
- The **top 10 most similar movies** are selected, excluding the movie itself from the recommendations.

5 Recommendations

- Indices of the top similar movies are used to fetch the titles from the dataset
- Maximum of 10 titles are then returned as a recommendation list
  - If the specified title is not found, it will prompt the user to check the input

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Continuous Improvement

- **PostgresSQL** - Improved Database Management
  - Complex queries, indexing, full-text search
  - Robust & Scalable database to manage structured data on Web Applications
- **Docker** - Improved Consistency Across Environments
  - Encapsulate applications and dependencies in container to facilitate continuous integration and deployment
    - Portability & Scalability
    - Isolation & Integration

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Your Favorite Reviews

Rotten Tomatoes

- Comprehensive Review Database
- Influential Impact

Metacritic

- The Metascore
- Weighted Aggregation Score

TMDB

- Community powered
- Customizable user experience with an open API

Fandango

- Ticket Integration combines movie reviews with ticket purchasing
- Review from verified ticket buyers

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Our Vision through StreamLit

Ease of Use + Security

- Open-source Python framework for Data Science & ML Engineers
  - Rapid prototype testing in web format
  - No more HTML, CSS or JavaScript
- Security & Scalability
  - StreamLit cloud provides support for password protection
  - Data transmission can be encrypted

Customization & Interactability

- Boilerplate template still provides a data dashboard and a wide range of widgets to interact with text data.
  - Custom Layouts & Themes
  - Markdown & HTML support
- Seamless library integration allows Python visualization without any special configuration
- Real-Time Model Predictions based up modifications to underlying Python script of data changes

Agile Development

- Smooth integration with Python Libraries
- StreamLit Cloud make application deployment easy with just a few clicks.
  - Web Deployable
- Comprehensive Documentation
  - API references, guides, and tutorials
  - Gallery examples for inspiration and best practices

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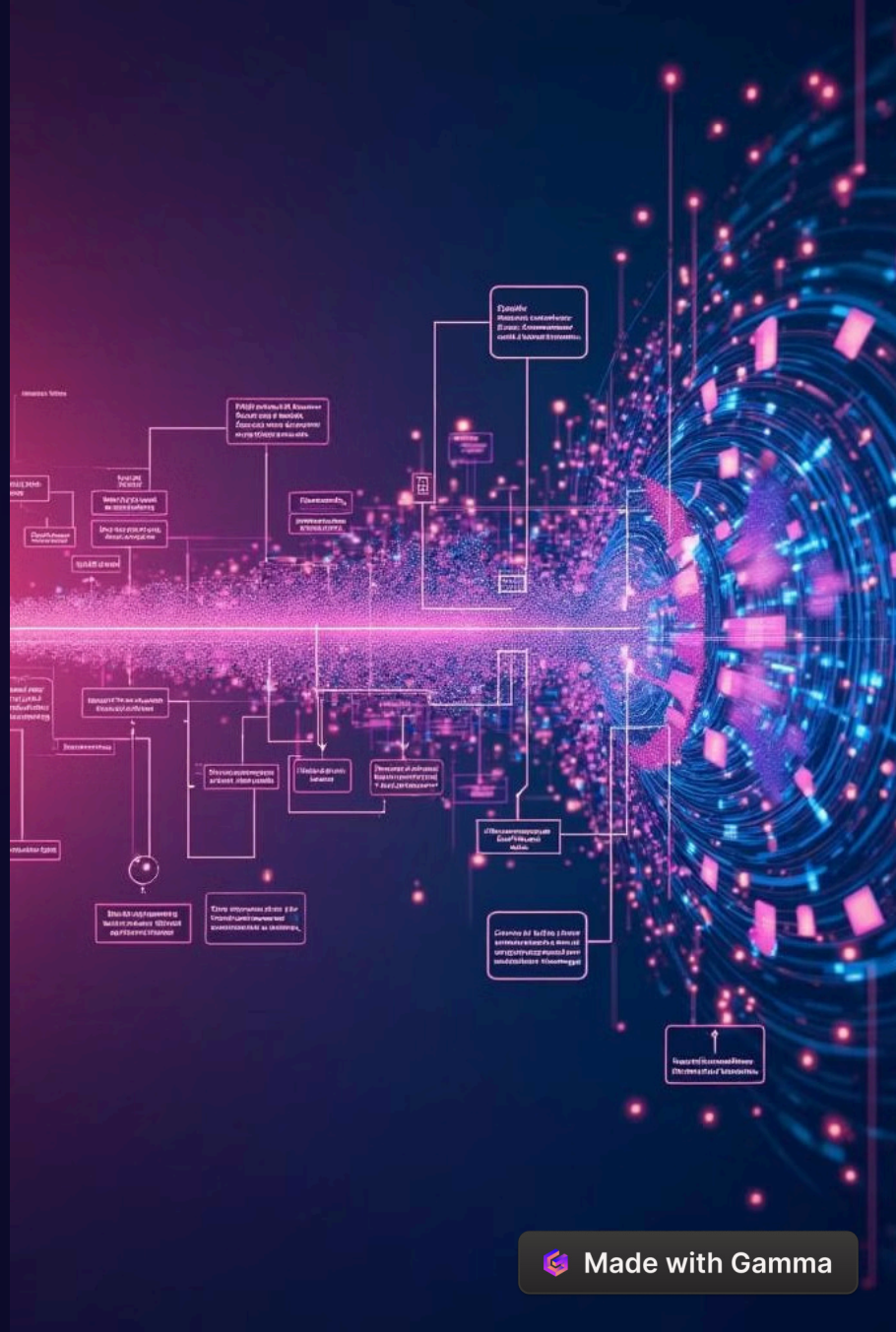
Key Challenges & Considerations

- Emotion Detection
  - VADER & LSTM models had lower accuracy scores
  - Deep neural networks built with The BERT Model as custom layers
  - Incorporating model into StreamLit App
- Recommendation System
  - KNN Recommendation System ran into memory error during training
  - Used custom function with cosine similarity score instead



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Natural language Processing

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